

7.7.4/1

## S-E-C-R-E-T

MEMORANDUM FOR: THE RECORD

SUBJECT : HRT-2 Tests [REDACTED]

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1. The tests to be described are a continuation of the HRT-2 tests performed [REDACTED]. The aircraft used in this field exercise was the C-54 which incorporated an AN/ARN-7 ADF. This ADF utilized a long-wire as the sense antenna. If the results of these tests are satisfactory, the next series will be performed overseas in conjunction with various operational groups in the field. These tests took place during the period of 31 October - 5 November [REDACTED]

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[REDACTED] This site was chosen for numerous reasons. In the first place, mountainous terrain exists which is similar to the terrain which can be expected in present prime operational areas. The general ground conductivity for over-land runs is of the order of 15 millimhos/meter which allows a maximum range comparison with the data taken [REDACTED] where the ground conductivity is relatively low, about 2 millimhos/meter. Also, runs could be made across [REDACTED] (ground conductivity approximately 5,000 millimhos/meter) to simulate an over-sea path to get some idea of the ranges to be expected. Other information sought in these tests was a comparison of the AN/A-42 antenna and the experimental [REDACTED] antenna, and also the capability of the new output matching section of the HRT-2 to match the long-wire balloon antenna.

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2. The personnel attending these tests were the following:



TSD/SB  
DPD  
TSD/AOB  
Commo

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Crew: Capt C. D. Bain Jr. Det. 1, Eglin Air Force Base  
Capt F. K. Jones Det. 1, Eglin Air Force Base  
Capt D. W. Hyston Det. 1, Eglin Air Force Base

RESULTS

1. During the period of these tests some difficulties were encountered in getting reliable maximum range information due mainly to the weather conditions and electrical disturbances caused by local storms.

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This latter phenomena resulted in wild gyrations ( $\pm 20^\circ$ ) of the DF needle which had a tendency to home to the disturbance. Obviously, determination of maximum ranges under these conditions was almost impossible, however, some information could be derived from the data taken under these conditions and this will be discussed below.

2. The data taken under good operational conditions is shown on Table I. The needle indication at ranges shown in column G was adequate for homing to guarantee positive over-station passage. The  $350^\circ$  heading is basically an over-land path and the  $280^\circ$  heading is over

[redacted] The differences in ranges achieved with these headings is due to the variation in ground conductivity. It is interesting to note that during previous tests of the HRT-2 and AN/A-42 antenna at [redacted] the maximum distances achieved at these altitudes ranged from 10 to 15 miles. This, once again, reflects the difference in ground conductivity.

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An increase in range was obtained when the experimental [redacted] antenna was used. This antenna is 35 feet high and top-loaded, and even though it is approximately 25 feet higher than the AN/A-42, its design simplicity resulted in a shorter erection time. Since line-of-sight at 500 feet is about 29 nautical miles, it can be seen that beyond line-of-sight was obtained at a heading of  $280^\circ$  with both antennas. At this heading, the distance of a run was limited due to a mountain range which is about 54 miles from [redacted] When utilizing the [redacted] antenna, the signal at 52 miles was still strong enough to result in a steady needle indication. Although we were beyond line-of-sight at this point, line-of-sight was further impaired by going behind a mountain range in the lake which is about 2500 feet higher than the elevation [redacted] This maneuver did decrease the range somewhat with the decrease being a function of the amount of mountain range between the aircraft and [redacted] In the runs made at 500 feet the worst range obtained for stable needle indication was 40 miles.

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The night tests indicate the same order of decrease in range as noted in previous tests. Due to the weather conditions only a limited amount of night tests were performed.

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3. Tests with the long-wire balloon antenna were made at 500 and 1000 feet at a heading of 350°. Unfortunately, these tests were made when the ADF was under the influence of local storm activities. As a result, the DF needle was very unstable and tended to home toward the disturbance. From an examination of the data taken, it could be estimated that the maximum range for stable needle indication under normal conditions would be at least 40 miles. Both the HRT-2 and RT/A-3 transmitters were used in these runs and both units gave about the same results. This indicated that the new output matching section was operating properly since in previous tests [ ] the use of the RT/A-3 which matches the long-wire reasonably well, resulted in much better ranges than the HRT-2.

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**CONCLUSIONS**

1. The AN/A-42 antenna should be eventually replaced with the TSL antenna due to the simplicity, ease of erection and increased efficiency of the latter antenna.

2. The statements made in previous memorandums stating that maximum range information taken [ ] were pessimistic due to the poor ground conductivity in that area are verified.

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3. Since the HRT-2 performed satisfactory during these tests, the test program should be continued as planned with the next series being held overseas.

**RECOMMENDATIONS**

The [ ] antenna program should be expedited with the hope that antennas of this type will be available for use with the 160 HRT-2's to be delivered on 31 January 1962.

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[ ]  
TSD/SS/ES

TABLE I

FREQUENCY - 1650 Kc

A	B	C	D	E	F	G	H	I
BEARING	INBOUND OR OUTBOUND TO	ALTITUDE	SIGNAL 1ST AUDIBLE (FM)	NEEDLE INDICATION 1ST RECEIVED (HM)	AZIMUTH ACCURACY	1ST STABLE NEEDLE (DM) '5 SPREAD	TIME FOR STATION PASSAGE (IN SEC)	REMARKS
DAY TIME TESTS								
150°	Inbound	1000	36	35	20°	27	5-6	<input type="checkbox"/> Antenna with HRT-2 50X1
150°	Inbound	500	36	34	30°	25	5-6	<input type="checkbox"/> Antenna with HRT-2 50X1
150°	Inbound	1000	27	26	20°	22	5-6	A-42 Antenna with HRT-2
150°	Inbound	500	27	25	30°	20	5-6	A-42 Antenna with HRT-2
180°	Inbound	1000	52	48	50°	43	5-6	A-42 Antenna with HRT-2
180°	Inbound	500	48	43	20°	40	5-6	A-42 Antenna with HRT-2
180°	Inbound	1000	52	52	5°	52	5-6	<input type="checkbox"/> Antenna with HRT-2 (range limited by mountain range) 50X1
180°	Inbound	500	52	52	5°	52	5-6	<input type="checkbox"/> Antenna with HRT-2 (range limited by mountain range) 50X1
NIGHT TESTS								
150°	Inbound	1000	35	20	20°	15	5-6	<input type="checkbox"/> Antenna with HRT-2 50X1
180°	Inbound	1000	45	45	5°	45	5-6	<input type="checkbox"/> Antenna with HRT-2 (range limited by mountain range) 50X1

SECRET